(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 158 831 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.11.2001 Bulletin 2001/48

(51) Int Cl.[7]: **H04Q 11/04**, H04J 3/08

(21) Application number: **01401270.2**

(22) Date of filing: **16.05.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **26.05.2000 IT MI001163**

(71) Applicant: **ALCATEL**
75008 Paris (FR)

(72) Inventors:
- **Licata, Giuseppa**
  20090 Segrate (Milano) (IT)
- **Colizzi, Ernesto**
  20052 Monza (Milano) (IT)

(74) Representative: **Colombo, Stefano Paolo et al**
Alcatel,
Intellectual Property Department, Vimercate
Via Trento, 30
20059 Vimercate (MI) (IT)

(54) Interconnection between telecommunication MS-SPRING and SNCP ring networks

(57) Described is an interconnection architecture between an MS-SP ring network and an SNCP ring network in a "Dual Node and Bridge and Switch" architecture through a primary interconnection node (M) and a secondary interconnection node (N) connected by an optical fibre span, said primary interconnection node (M) comprising means for carrying out a Drop and Continue (D and C) operation and a service selector (SS_M) for each circuit. The architecture provides for closing said SNCP ring network (RING 2) through the service selector (SS_M) of the primary node (M) of the MS-SP ring network. In this way the management of the selectors is simplified, less I/O interfaces as well as less optical fibre are used and the available band is better exploited.

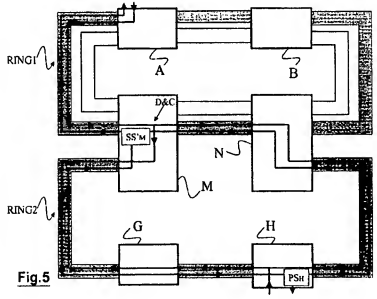

Fig.5

EP 1 158 831 A2

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention generally pertains to telecommunications networks and in particular to interconnection between an MS-SPRING network and a High-Order SNCP ring network.

[0002] In modern telecommunications networks it is becoming extremely important to have the possibility to repair the failures occuring in the networks themselves without impairing the functionality of the service. Therefore ring architectures are more and more frequently used and furthermore the telecommunications networks are generally provided with protection means against possible failures of their components.

[0003] In the SDH MS-SP (Multiplex Section Shared Protection) RING networks, for instance, a distributed protection mechanism is implemented that allows the automatic traffic restoration should a fault occur in the connection fibers. In other words, the MS-SP ring networks perform the automatic traffic restoration through a synchronized re-routing of said traffic, which is carried out at each node of the ring. This operation is controlled by a protocol consisting of messages that are continuously exchanged between adjacent nodes. Said protocol and the related operations are defined by several international standards, issued by ANSI, by ITU-T and by ETSI, and they are characterized by a certain set of rules and messages. See for instance the ITU-T Recommendation G.841.

[0004] An SNCP ring network (see definition 3.31 set forth in ITU-T Recommendation G.805) is a ring network with a type of protection which is shaped by a sublayer generated by expanding the connection point of the subnetwork (where, by "subnetwork" is meant that topological component used to carry out the routing of a specific characteristic information).

[0005] One of the most important network architectures is composed by the interconnection of ring networks using a "Dual Node and Drop & Continue" architecture, namely, an architecture where two nodes of each ring are interconnected. The "Drop & Continue" function that is a function that is implemented within a node wherein the traffic is dropped from the working channels on the ring and, at the same time, continued over the ring.

[0006] The classic solution provides for four network elements or nodes (two for one ring and two for the other ring) that are interconnected through STM-N interfaces; however, through the use of large ADMs (Add Drop Multiplexers) or DXCs, (Digital Cross Connects) that substantially integrate two nodes and operate as ring closures, it is possible to reduce the overall number of interconnection nodes to two. In this case the interconnection is done in the network element matrix without using the STM-N interfaces.

[0007] The "Dual Node and Drop & Continue" architecture is known from the ITU-T Recommendation G. 842 but such a Recommentadion only provides for the case of four separate interconnection nodes. Even if one would integrate two nodes into one (thus avoiding the use of STM-N interfaces) this solution would have the same inconvenlences from a management point of view since three selectors for each circuit should be anyway used and managed. Another drawback of this possible solution wherein two nodes are integrated into one is that it would be expensive in terms of fiber utilized and band exploitation.

[0008] In view of the known solutions and disadvantages thereof, the main object of the present invention is to indicate an interconnection architecture between an MS shared protection ring and a Dual Node and Drop & Continue high order SNCP ring by utilizing only two nodes but avoiding the management complexity of the known solutions.

[0009] A further object of the present invention is to provide an architecture of the aforesaid type which is less expensive in terms of optical fiber utilized and in terms of bandwidth.

[0010] These and further objects are achieved through a method according to the independent claim 1 and through a network element according to the independent claim 2. Further advantageous characteristics of the invention are set forth in the respective dependent claims.

[0011] The basic idea of the present invention consists in closing the SNCP ring directly in the Service Selector of the MS shared protection ring.

[0012] The invention will certainly result in being clear in view of the following detailed description, given by way of a mere non limiting example, to be read with reference to the attached drawings, wherein

- Fig. 1 shows an MS shared protection ring interconnected with an SNCP ring in a Dual Node and Drop & Continue architecture which is performed with four Network Elements in which the path is from node A to node H;
- Fig. 2 is similar to Fig. 1, but the path is in the opposite direction, namely from node H to node A;
- Fig. 3 shows an MS-shared protection ring interconnected with an SNCP ring in a Dual Node and Drop & Continue architecture realized with only two Network Elements in which the path is from node A to node H;
- Fig. 4 is similar to Fig. 3, but the path is in the opposite direction, namely from node H to node A; and
- Fig. 5 shows an MS shared protection ring interconnected with an SNCP ring in a Dual Node and Drop & Continue architecture according to the present invention.

[0013] The same reference numerals will be used to designate similar parts or functionally equivalent components throughout the several figures. In the various figures, there are always depicted a four-fiber MS shared protection ring network (RING 1) and an SNCP

ring network (RING 2) connected through nodes or network elements (C, D, E, F; M,N). Node C of Figures 1 and 2 (node M of Figures 3 to 5) is considered the primary node of the MS shared protection ring whereas node D of Figures. 1 and 2 (node N of Figs 3 to 5) is considered the secondary node of the MS shared protection ring. In RING 1, the (protected) working fiber is indicated by grey "tubes" whereas the protection fiber is indicated by white "tubes". The various paths are depicted by solid bolt lines provided with arrowheads to clearly show the direction (substantially according to the ITU-T Recommendation G. 842). Naturally, the fact of representing RING 1 as a four-fiber ring is simply dictated by practical reasons of representation, but the same concepts apply to two-fiber rings.

[0014] With reference to Fig. 1, a protected path from a source node A to a destination node H utilizes a working fiber from A to C (primary node); the Drop & Continue (D&C) function is performed at C, namely the traffic is dropped towards node E of RING 2, but it is also pessed through to the secondary node D; then it passes from node E to node G (which ellows it to pass through) up to the destination node H; at the same time, the continued traffic passes from node D to node F until it reaches the destination node T too. Present in the node H is a Path Selector (PS_H) that selects the path coming from one side or from the othar (depending on the path status).

[0015] In Fig. 2 the same architecture with path from H to A is shown. The path goes from H (source node, RING 2) to A (destination node, RING 1). The signal goes from noda H 1) to node G up to node E where it is i) dropped and sant to a Path Selector (PS_E) and ii) continued towards the Service Selector (SS_F) of node F; and 2) to node F where it is iii) dropped towards the Service Selector SS_F and iv) continued towards the Path Selector PS_E of node E. The path passes from the Path Selector PS_E of node E to a Service Selector SS_C of node C. Similarly, the path passes from the Service Selector SS_F of node F to node D and to the Service Selector SS_C of node C. The Service Selector SS_C selects one of the two signels and sends it to the destination node A.

[0016] This known solution has the disadvantages that it utilizes four nodes for the Interconnection, bandwidth and tributary ports for establishing the interconnection between each pair of nodes.

[0017] The architecture of Figs. 3 and 4 is functionally similar to the one of Figs. 1 and 2 but the Network Elements C and E are integrated into a single network element M (en ADM or a DXC). An analogous argument applies to nodes D and F, integrated into N. In this case, the advantage resides in the reduction of both epparatus and interconnection interfeces but it introduces the disadvantage that three selectors (two of which (SS_M, PS_M) in the same matrix) are to be managed, that fiber between primary and secondary nodes is not utilized in en optimal manner and that some bandwidth is not used.

[0018] Before entering into a description of the architecture in accordance with the present invention with reference to Fig. 5, brief reference will be made to the concept of primary node and Service Selector (SS) in an MS shared protection ring network. The primary node is that node which provides the Service Selection and Drop & Continue (D&C) functions for a tributary. Naturally, different tributaries can have different primary nodes designated. A Service Selector (SS) is the function of a node that is used for ring interconnection. It selects the traffic from channels coming from one side of the node or the traffic entering the ring, according to certain criteria.

[0019] As it will be readily noted, the architecture of the invention adopts a "Dual node and Drop & Continue" function realized with only two connection nodes (M and N). The primary node of the MS shered protection ring, Node M, comprises the Service Selector (or Bridge & Switch selector) SS_M and just this selector is utilized to close the HO SNCP ring.

[0020] Thus, a path entering the MS shared protection ring network (RING 1) from node A will reach the primary interconnection node M where it will be dropped towards the SNCP ring (RING 2) within the matrix, it will pass through the intermediate node G and reach the Path Selector (PS_H) of the destination node H. In the network element M the path is also continued (D&C) towards the secondary interconnection node N so as to reach the Path Selector (PS_H) of the destination node H that will choose which of the two paths should be dropped.

[0021] The path from H to A will traval down the SNCP ring (RING 2) in both directions and reach the Service Selector (SS_M) of the primary node M by passing through both node G and the secondary noda N and by utilizing the fiber spen N-M of the MS shared protection ring. The Service Selector (SS_M) of the primary node M in turn selects one of the two signals and will send it to the destination node A.

[0022] The most apparent advantega of this solution is that the fiber span of the RING 2 between the interconnection nodes is missing. The further advantage is that the number of STM-N ports utilized is reduced (a pair of I/O ports for each Network Element is saved).

[0023] A further and important advantage is that the number of selectors that the Network Manager and the Network Element have to manage passes from three (state of the art arrangement) to one. All this, naturally, without impairing the reliebility against breaks under any circumstances.

[0024] The functions of primary and secondary nodes could be implemented both in hardwere and in software and for this reason the present invention encompasses a computer program comprising code means adapted to carry out all the steps of the method when said program is run on a computer. It also comprises a computer-readable medium having a program recorded thereon, said computer-readable medium comprising code means adapted to carry out all the steps of the method

when said program is run on a computer.

[0025] A new network architecture has been described to advantageously connect an MS shared protection ring with an SNCP ring that achieves all the intended objects. Many changes, modifications, variations and different uses of the present invention will however become apparent to those skilled in the art having considered the present description and the attached drawings illustrating preferred embodiments thereof. Such changes, modifications, variations and different uses that do not depart from the spirit and the scope of the invention, are held to be covered by the invention that is limited only by the following claims.

Claims

1. Method for interconnecting an MS shared protection ring network (RING 1) with an SNCP ring network (RING 2) in a "Dual Node and Bridge & Switch" architecture through a primary interconnection node (M) and a secondary interconnection node (N) connected by an optical-fiber span, said primary interconnection node (M) comprising means for performing a Drop & Continue (D&C) operation and a Service Selector (SS_M) for each circuit, the method being **characterized by** the step of:

   closing said SNCP ring network (RING 2) through the Service Selector (SS_M) of the primary node (M) of the MS shared protection ring network.

2. Method according to claim 1, wherein said step of closing said SNCP ring network (RING 2) through the Service Selector (SS_M) of the primary node (M) comprises the steps, carried out in the primary interconnection node (M), of:

   receiving a signal entering the MS shared protection ring network (RING 1), dropping it towards said SNCP ring network (RING 2) and continuing it towards the secondary interconnection node (N) by utilizing the optical fiber span connecting the primary and secondary nodes (M, N);
   selecting one signal, by means of said Service Selector (SS_M) between

   a signal coming from said SNCP ring network (RING 2) and directly entering the primary node (M) and
   a signal coming from said SNCP ring network (RING 2), passed through the secondary node (N), and entering the primary node (M) by traveling down the optical-fiber span that connects the primary and secondary nodes (M, N); and

   sending said signal that has been selected by the Service Selector (SSM) to the destination node (A) of the MS shared protection ring network (RING 1).

3. Network element (M) for interconnecting an MS shared protection ring network (RING 1) and an SNCP ring network (RING 2) in a "Dual Node and Bridge & Switch architecture, said node comprising a Service Selector (SS_M) for each circuit, **characterized in that** said Service Selector (SS_M)

   selects one signal between:

   a signal coming from said SNCP ring network (RING 2) and directly entering the primary node (M) and
   a signal coming from said SNCP ring network (RING 2), passed through the secondary node (N), and entering the primary node (M) by traveling down the optical-fiber span that connects the primary and secondary nodes (M, N), and

   sends said selected signal to the destination node (A) of the MS shared protection ring network (RING 1).

4. Computer program comprising code means adapted to perform all the steps of claims 1 and 2, when said program is run on a computer.

5. Computer-readable medium having a program recorded thereon, said computer-readable medium comprising code means adapted to perform all the steps of claims 1 and 2 when said program is run on a computer.

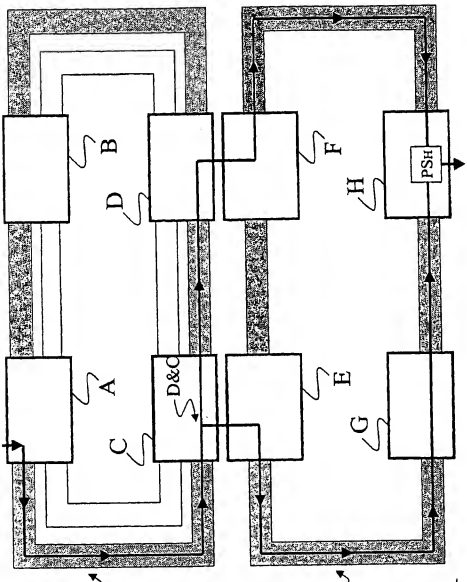

Fig.1

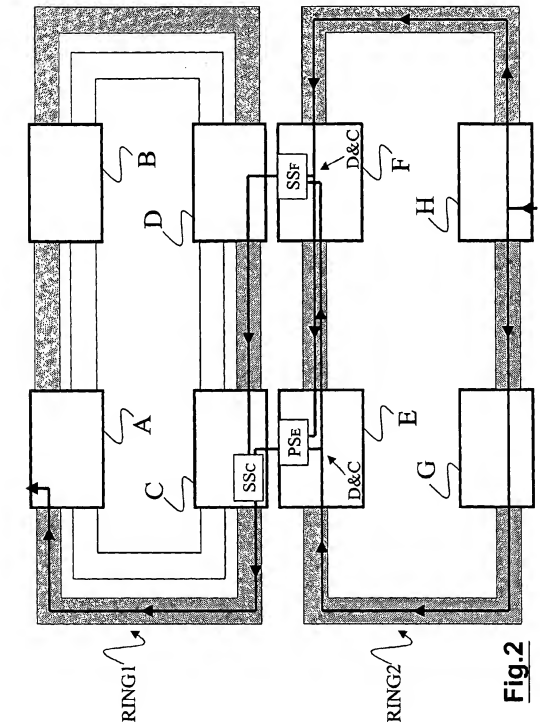

Fig.2

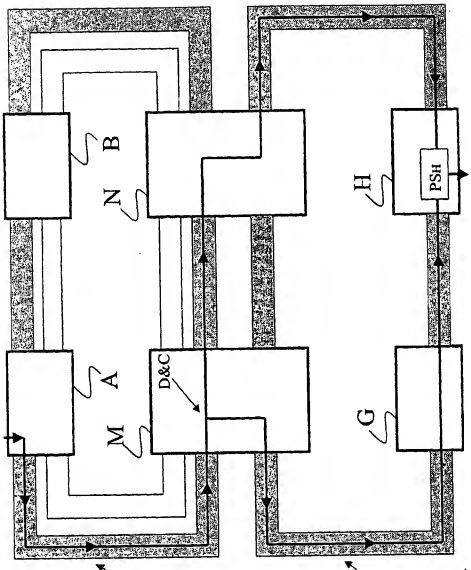

Fig.3

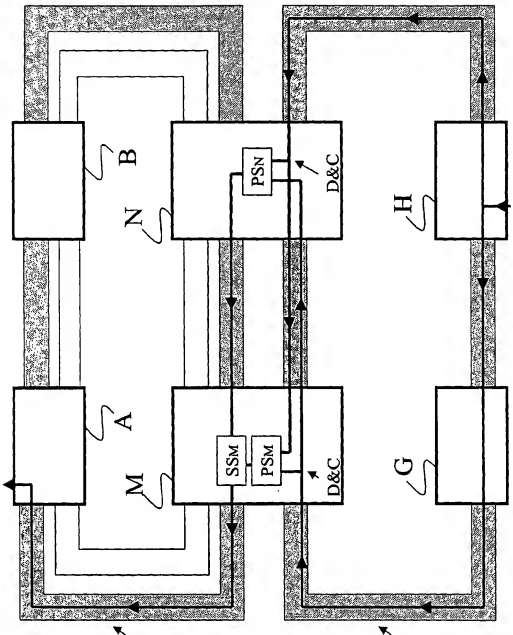

Fig.4

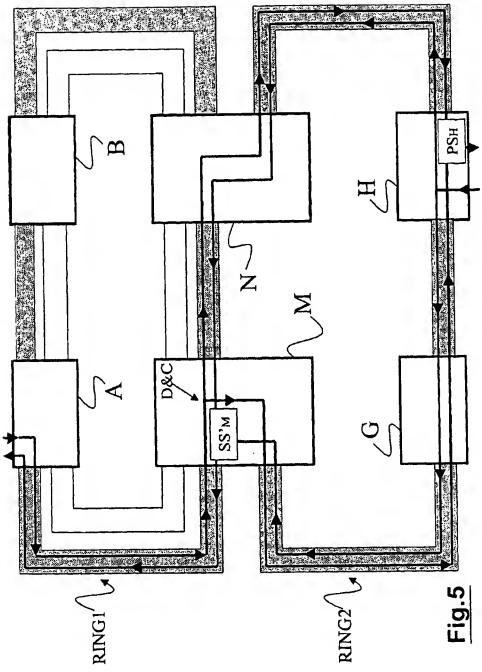

Fig.5